

Brazilian Companies and the Grade of Investment

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Abstract— This study is featured in the context of applied typology, of descriptive goal with bibliographic outlining, in the extent of the issue it is features as quantitative, comprising the population of 70 Brazilian corporations recognized by the international certifying agents Standard & Poor's, Moody's and Fitch Ratings, which held the corporate investment grade in the year of 2012. Regarding the goal, the scope of this study was the development of an economic and financial indicator aiming to delimit the investment grade that companies present in their corporate structures, through a set of economic and financial indexes linked to liquidity, profitability, debt, and yield, from economic and financial demonstrations of the corporations studied.. The conclusions of the study were based in the results presented by the evolution of the statistical treatment, which were shown to be consistent for the model developed. The reliability of the model of corporate investment grade from the factorial analysis was testified by the Cronbach's Alpha coefficient that presented value of 0.768, therefore indicating satisfactory consistence to the study.

Keywords— **Investment Grade. Indicator. Corporations.**

Scientific Area: Corporate Finance.

I. INTRODUCTION

The economic development goes through the constant evolution of corporations that generate employment, income, and development, under this competence the State, which gets resources from all institutions that are directly or indirectly in its control, is maintained through this juncture and seeks to socialize resources so they will return to this producing society in the form of benefits.

A developed economy necessarily involves consistent corporations, so the investment grade takes on importance in the economic context in view of the attractiveness of new corporate investments generating new ventures, thus leading to a complete economic development. The investment grade may be seen as synonym for strong economy, because it reflects the financial and economic situation of the corporations that support the internal market.

Generically, individuals think and speak about economy during much of their time, because economy consists in millions of people involved in many activities such as buying, producing, working, selling and distributing.

The economic gear is developed by economic agents, who are natural or legal persons that contribute to the functioning of the economic system, through their actions.

In one hand, corporations produce and sell goods and services, on the other hand, individuals as consumers who are, at the same time, owners of productive resources provide corporations with production factors such as: labor, land, capital, and business capability, receiving salaries, rents, interests, and profits in return. With these yields they acquire new goods and services produced by corporations, so moving wealth generation.

In a globalized and competitive economical context, organizations need to evolve in order to follow the changes the environment imposes, seeking sustainability and perpetuity. As the rhythm of changes increases, the durability of business strategies decreases, causing the need for uninterrupted transformations with permanent restructuring processes.

In this context, economic and financial instruments play relevant importance to decision making, hence, the proposal of building an economic and financial indicator that aims to analyze and assess the investment grade of a corporation meets on the actual moment in which information and decision are united within the process of development and assertion in the market, and on the other hand, the pressure for self-sustainable development in national and international markets is not lower.

II. THEORETICAL REFERENCE

With crescent enterprise competitiveness, along with business dynamics boasted by globalization of economy, it has been observed the increase of the need for measures that better prove economic positions and the organizational performance. However, it is noteworthy that the performance of an organization may suffer economic

interferences from governmental politics, which could cause modifications of strategies and other difficulties to achieve goals (Sims, 1980).

Facing that “companies are rediscovering traditional indicators in the field of economy and finances, however formulated in a very modern and sophisticated mode, globally spreading their use” (Assaf Netto, 2002, p. 206).

2.1 – INVESTMENT GRADE

Regarding contemporary international finances dominated by a system determined by markets (*market led finance*), in the view of Prates and Farhi (2009), the agents’ need for information has considerably widened. The generalized access to information, especially the one that allows assessing financial solidity and corporations’ risks, began to play a crucial role.

Many mechanisms that seek to lessen asymmetries of information have been developed. First, private companies were created (*Credit Rating Agencies*) with the specific goal to provide comparative indicators of the risks of a universe of debt instruments (credit risks classifications) of businesses and, later, of countries, which sought to obtain resources in financial markets (Lyon, 2009).

Its development reached exponential rates from the 1970’s on, with the process of financial internationalization and securitization of public and private debts. It returned to be emphasized with the expansion of securitization of credit assets (*asset backed securities*) and with the approval and implementation of the Basiléia II agreements, which incorporated the ratings of determined agencies in the rules of bank credit risks assessment.

The accomplishment of the investment grade by international certifying rating agencies is still a landmark for corporations or countries, once an emission classified as investment grade will have easier access to credit at lower costs (Prates, Farhi, 2009).

As an effect, many corporations, by means of status, may only invest in assets considered low risk. However, the performance of these agencies depends a great deal on their reputation. Such reputation was seriously shaken in performance at the 1997 Asian crisis, in the episodes of fraudulent accounting of corporations such as Enron and WorldCom in 2001/2002, as well as at the subprime loans crisis, which may lead to significant changes in its importance and/or its operation (Cantor, Parker, 2005).

The financial market, especially the international, became so more integrated, facilitating resources transference, either for speculative or commercial purposes. Therefore, investors who apply their savings in public or private securities, move resources globally, should value to know the risks assumed in each operation.

These investors not always have time and money available to perform the collection of macroeconomic, sectorial, or even corporation data, which would certainly decrease the barriers of their resources. This work is supplied by risk agencies, which are institutions that search and analyze information about different kinds of credit titles in different parts of the world and classify the risks of each one of investments. Thus, investors that adopt risk classifications from agencies do not need to worry in performing a detailed data collection to execute their operations, they just have to read the reports and observe the notes provided by the agencies for a decision making of investment, since they do not have yet an indicator that can provide a tendency of credibility for the investment.

The title of “good payer” is given to companies and countries through the investment grade. The name references to a quality stamp that indicates really low risk of non-compliance. Companies or countries, once they received the investment grade, may obtain better credibility references in the market. Specialized companies that operate worldwide concede this classification; the three risk classification agencies with greater visibility are *Standard & Poor’s Service, Moody’s Investors Service and Fitch Ratings* (Ferreira, 2010).

These companies provide the risk classification service, promoting a rating to a certain debtor. A rating, according to Hill (2004), is seen as an opinion of the certifying agency regarding quality, especially credit liquidity, which tries to estimate the future default probability, or the non-payment of financial obligation. Therefore, rating does not concern an indication of purchase, sale or maintenance of any asset.

The rating activities have been developed by many agencies 1909, when John Moody founded the first agency, the *Moody’s Investors Service*. Later were founded the *Standard & Poor’s* in 1916 and the *Fitch* in 1924 (Hill, 2004). The ratings are divided in sovereign and corporate investment grades.

2.1.1 – Sovereign investment grade

The most widespread mode of risk calculated by risk agencies is the sovereign risk that aims to assess the debt paying capacity of a country. Agencies classify paying capacity of countries assigning them a determined score, which is inserted in some grade.

Governments with difficulties of honoring their compromises may receive scores situated in the speculative grade; as for countries with good paying capacity they receive scores inserted in the investment grade. This grade division is important because according to Vieira (2008, p.3), “there are pension funds in many countries, especially Asia and Europe, which may only apply in markets that already count on the investment grade.

There is not any ready formula to determine the probability of non-compliance of a government, the sovereign credit rating is considered most important and the one that causes greater effect on the financial market. Cantor and Packer (2005, p.38), explain this importance: Sovereign ratings are important not only because some of the greatest operators in the international capital market are national governments, but also because their announcements affect the ratings conceded to loan borrowers from the same nationality.

When announcing a change of any score in sovereign rating, risk agencies discuss, even if briefly, about the reason for that upgrade. According to Gomes (2008), the difference between the rating of sovereign credit or sovereign risk and the country-risk is based on the fact that the country-risk is the difference of bond yields of a country from the called risk-free rate. The market considers as risk-free rate the rate paid by the United States treasury. The sovereign risk is nothing more than the opinion of risk agencies on the quality credit of the country. It has a long-term feature, being only influenced by the short-term changes if these affect the juncture in the

long-term. However when it comes to country-risk, it is a lot more vulnerable to short-term changes. Although they are two completely different concepts, they are correlated. If the sovereign risk is very low, that is, if the country presents good conditions of honoring its commitments, it is probable that the country-risk is also low. The sovereign investment grade may influence the corporate investment grade, for its credibility relevance to corporations.

2.1.2 – Corporate investment grade

Corporations are classified in a scale that goes from high probability of non-compliance to the total capacity of paying debts within the deadline. Technically, they are arranged in a ranking with scores and are grouped in categories, divided in investment grade and speculative grade. The best qualification that a corporation may achieve is Aaa (for Moody's) or AAA (for Standard & Poor's and for Fitch, as they use the same symbols). On the other hand, the worst is C (Moody's) or D (Standard & Poor's and Fitch). Figure 1 shows the risk scale used by companies.

Fig.1: Used risk classification

Scale of agencies' global ratings			
Moody's	Fitch Ratings	Standard & Poor's	Meaning
Aaa	AAA	AAA	Highest quality
AA	AA	AA	High quality
A	A	A	Medium/high quality
Baa	BBB	BBB	Medium quality
BA	BB	BB	Predominantly speculative
B	B	B	Speculative, low classification
Caa	CCC	CCC	Close default
C	C	C	Lowest quality, no interest
	DDD	DDD	Defaulting, overdue, questionable
	DD	DD	Defaulting, overdue, questionable
	D	D	Defaulting, overdue, questionable

Source: Standard & Poor's, Moody's and Fitch Ratings (2008).

Agencies practically use the same system of equivalent letters and signals. Thus, the best classification a country may obtain is Aaa (Moody's) or AAA (Standard & Poor's), which conceptually mean "extremely strong capacity of meeting financial commitments". In the opposite edge, a bond classified as "C", for Standard & Poor's or Moody's, has a very high risk of not being paid. The "D" classification is assigned by Fitch Ratings and by Standard & Poor's regarding default.

It is admitted that the market does not create a consensus around companies that might become investment grade and also does not declare this expectation such as in the assessment of countries. However, since the analysis is done case by case, an observation of the

company's characteristics may indicate whether the company is on track for that and serves as a warning to the investor market. The investor must be aware to the credit quality of the company regarding its local currency, as well as the international markets juncture. Carvalho (2008) explains that specialist state that this is the first analysis to be done because the company may have different scores in local and foreign currency and the investment grade in local currency is needed before receiving it in foreign currency. Furthermore, it is imperative to evaluate how the transparency of this corporation in the market is presented and if it has conditions of honoring the commitments, local and international.

With the investment grade classification, corporations are considered more reliable and, therefore, may obtain funds at lower costs, generating benefits to their economic and financial results. According to Freitas (2006), classifying agencies of corporate investment grade consider to its achievement, that they must combine many factors, among which are: capacity for cash flow generation, liquidity grade, stable debt, profitability compatible to yield, position of leadership in the market, costs competitiveness, significant volume of exportation, favorable scenario of demand of its main products, among other factors.

One of the factors that help creating higher demand for the role of these corporations, and consequently, greater appreciation potential, is their inclusion in the range of options of foreign funds which can only negotiate shares from companies with investment grade. For that, analysts state to be a good investment option to bet in companies with high investment grade or that are close to achieving it.

According to Albanez and Valle (2009) high-risk corporations tend to be less indebted, since the higher the risk, the higher the probability of default, as well as the reduction of their funding capacity.

According to Rogers (2008) companies that improve their debt situation and start to negotiate shares on the new market are well regarded by foreign investors. This may be the first step, since the investment grade title is a consequence to the company that was already demonstrating these characteristics. When a company

reaches the investment grade, it represents low credit risk and reduced vulnerability. The main drive for companies to achieve a better classification of their debt is based on cost reduction for fund raisings, still with the ongoing pressure of competitiveness increase, especially comparing to international competitors. Companies that gained the investment grade start to access the market differently. All companies seek the classification because it represents a competitive advantage in the way they are financed.

To achieve the investment grade, a corporation needs to basically prove that it has conditions to honor its commitments with external and internal markets despite of government moves. Receiving the investment grade is just a start point to corporations. The improvement in capital structure and improvement of investors' interest does not happen overnight.

Over the last decades important changes happened regarding corporation management, such as the productive restructuring, aiming higher profits and therefore improved yields. Among these changes, there is the spreading of the certification process, in which corporations try to inform and signal consumers that are meeting quality standards and rules expected by the market, presenting a brand or stamp given by an assessment body.

Besides countries, corporations also receive the so-called investment grade. In the year of 2008 base of this article, there were 70 Brazilian corporations that presented the "stamp of approval" certification, in at least one of the agencies. Figure 2 presents this group.

Fig.2: Brazilian companies that presented the investment grade in 2012

Fitch Ratings Corporations	Standard & Poor's Corporations	Moody's Corporations
Aracruz Celulose S.A. Indústria Florestal	Aços Villares S.A.	B2W – Companhia Global do Varejo S.A.
Natura Cosméticos S.A.	Cosan S.A. Industria e Comercio Agroindústria	Bandeirante Energia S.A.
Gerbau S.A.	Cimento Tupi S/A	Brasil Telecom S.A.
Braskem S.A.	AES Sul Distribuidora Gaucha de Energia S.A.	Cemig Distribuição S.A.
Rio Grande Energia S.A.	Andrade Gutierrez Participações S.A. Engenharia e Construção	Duke Energy Int'l Geração Paranapanema S/A
Camil Alimentos S.A.	BR Malls Participações S.A.	Magnesita Refratários S.A.
Companhia de Bebidas das Américas (AmBev)	MAXITEL S.A.	Sadia S.A.
Construtora Tenda S.A.	Camargo Correa S.A.	
Duratex S.A.	Companhia Siderúrgica Nacional (CSN)	
Amil Participações S.A. (Amil)	ALL - América Latina Logística S.A.	
GOL Linhas Aéreas Inteligentes S.A.	Bertin S.A.	
Lojas Americanas S.A.	Diagnósticos da America S.A.	
Minerva S.A.	Gafisa S.A.	

Trisul S.A.	Globo Comunicação e Participações S.A.	
Construtora Norberto Odebrecht S.A. - CNO	Iguatemi Empresa de Shopping Centers S.A.	
Petróleo Brasileiro S.A. - Petrobras	Imcopa Importação, Exportação E Industria De Óleos S/A	
Redecard S.A.	J. Macedo S.A. Produtos Alimentícios e Afins	
Suzano Papel e Celulose S.A.	Klabin S.A.	
TAM S.A.	Forjas Taurus S.A.	
RBS Comunicações S.A.	Localiza Rent a Car S.A.	
Unipar – União de Indústrias Petroquímicas S.A.	Lupatech S.A.	
Vale S.A.	MRS Logística, S.A.	
Fabricas de Alimentos Vigor S.A.	MRV Engenharia e Participações S.A.	
Wtorre S/A.	Eletrobras – Centrais Elétricas Brasileiras S.A.	
Votorantim Celulose e Papel S.A.	Net Serviços de Comunicação S.A.	
Votorantim Cimentos S.A.	PDG Realty S.A.	
Unidas S.A.	Rossi Residencial S.A.	
	Santher-Fábrica de Papel Santa Therezinha S.A.	
	Santos Brasil Participações S.A.	
	Tecnisa S.A.	
	Tele Norte Leste Participações S.A.	
	Telemar Norte Leste S.A.	
	Ultrapar Participações S.A.	
	Usinas Siderúrgicas de Minas Gerais S.A.	
	Vanguarda do Brasil S.A.	
	Vivo Participações S.A.	

Source: Research data.

Through the analysis of Figure 2 it is noted that in 2012 there was already a significant number of Brazilian companies that presented the investment grade, showing the importance of this factor.

With the goal to develop an investment grade indicator, it has to be based on the analysis of economic and financial indexes made by liquidity indexes, *Ebitda* adjusted profitability, yield and corporate debt, which are part of the set of economic and financial quotients responsible for reflecting the performance of an organization.

With changes occurred mainly from the 1980's on, organizations entered a new context featured by an open and dynamic market in which competition and changes were intensified, especially regarding technology (Gomes, Salas, 1999).

Leidfried and McNair (1994) state that organizations began to promote product alterations, managerial processes and techniques, so these were not an

option anymore, but a survival mode. Facing this reality comes the need for new indicators, since they can contribute to the permanence of companies.

One of the challenges for organizations regards to the use of appropriate measures in the business assessment process. Gomes and Salas (1999) mentioned that using inadequate measures damages the performance assessment process of organizations, considering the environment they are inserted in and the risks involved in the process. Therefore it is necessary to establish criteria for economic and financial analysis.

2.2 – ECONOMIC AND FINANCIAL INDEXES

The creation of an economic and financial index that contemplates the investment grade was based in studies performed regarding the issue, reinforced by the observation of inexistence of such indicator. The last decades experienced important changes regarding global economy, corporation management, with the example of

the productive restructuring, new ways to manage a business, aiming the process of financial globalization.

Currently, according to Wernke and Lembeck (2004), the professionalization of corporation management has increasingly demanded economic and financial models able to produce useful and relevant information to support the decision by which the corporate investment grade is extremely relevant.

Regarding the economic market, it is observed that there is not a consensus when it comes to corporations that might become investment grade, without any open expectation about it as it happens in the assessment of countries. However, since the analysis is done case by case, an observation of the corporations' features may indicate if the company is on track to achieve the investment grade.

Facing this scenario, the analysis focus of this article is based on the economic outcome, yield, debt, and cash flow, considering that an organization that aims perpetuity in business must maintain its operational results from end activities positives, so being able to maintain its income, attracting investors and generating dividends. These indexes are literally known as profitability, yield, debt, and liquidity indexes.

These variables may provide increased cash flow capacity where the results are reinvested on the operational structure, causing new outcomes and, therefore, keeping the business' liquidity, which in turn will generate liabilities that will decreasingly compromise the capital structure. Thus, indexes that serve as base to the creation of an investment grade indicator are treated individually, them being: liquidity indexes, profitability indexes, debt indexes, and income indexes, based on quotients of immediate liquidity, current ratio, quick ratio, Ebitda, solvency, asset turnover, total debt, net equity debt, asset income, and net equity income.

III. METHODOLOGY

Concerning methods and procedures, firstly the correlation analysis was used, which according to Corrar, Paulo and Dias Filho (2009) is a measure that shows the relationship level between two variables. This analysis shows the relationship level between variables, providing a number, indicating how variables range jointly. There is no need to define the relations of cause and effect, or, which one is the dependent or independent variable. The method usually known to measure the correlation between two variables is the Pearson's Linear Correlation Coefficient, also known as Product Moment Correlation Coefficient. This was the first correlation method, studied by Francis Galton and his student Karl Pearson, in 1897 (Schultz, Schultz, 1992). This correlation coefficient is used in the Principal Components Analysis, Factorial Analysis, Reliability Analysis.

This study used the base of corporations recognized by the international certifying agencies, *Standard & Poor's*, *Moody's* and *Fitch Ratings*, which had the investment grade in 2008, with random choosing of 11 indexes linked to the cyclical economic and financial structure, covering aspects of liquidity, profitability, debt, and income.

The model was construction base the confirmatory factor analysis, which is a method used to investigate the dependence of a set of variables expressed in relation to a smaller number of latent variables. It concerns to a technique of multivariate statistics analysis created to identify structures within sets of variables observed (Hair. *et al.*, 2005).

This analysis is applied at the moment there is a large number of correlated variables, with the objective to identify a smaller number of new alternative variables, not correlated and that, somehow, summarize the main information of the original variables finding the factors or latent variables (Mingoti, 2005).

IV. DATA DESCRIPTION AND ANALYSIS

This chapter presents the Pearson's correlation analysis and the factorial analysis.

4.1 – FACTORIAL ANALYSIS OF INDEXES ANALYZED

To justify the use of factorial analysis one must have a substantial number of correlated variables. Pearson's correlation matrix (Chart 3) aims to show the number of correlated variables and indicate the possible use of factorial analysis. The correlation matrix (Pearson) predominantly shows weak correlation among many variable indexes (indexes under 0.3), however, statistically considerable ($p < 0.05$).

According to Johnson and Wichern (2002), one of the objectives of factorial analysis is the combination of variables that create new factors, constructs, or analysis dimensions. These variables, according to Lachenbruch (1985), are grouped because of their correlations. Hence, the goal was to, facing the application of the factorial analysis technique, replace the initial set of 11 indexes by a smaller number of factors, maintaining a meaningful explanation for the original variables, so to identify the latent dimensions of the phenomenon.

In this study, the *Kaiser-Meyer-Olkin Test (KMO)* and the *Bartlett Test of Sphericity (BTS)* were applied. The KMO tests the adequacy of the factorial analysis use. If the correlation between the tested variables is small, or, the result of the KMO test is close to 0, the use of the factorial analysis is inadequate. On the other hand, if this value is close to 1, the factorial analysis may be employed. Thus, it indicates the level of data explanation from the factors found in the factorial analysis. The test verifies if the

correlation matrix in an identity matrix, which would indicate that there is no correlation among data. According to Hair Jr. et al. (2005), a practical significance criterion is met at an assumed level of significance of 5% and rejects the hypothesis of identity correlation matrix. In all reported cases, the samples showed to be inadequate to the factorial analysis application ($KMO > 0.5$). However, the *Bartlett Test of Sphericity (BTS)* verifies the hypothesis that the correlation matrix is an identity matrix (diagonal equals 1 and all other measures equal zero), in other words, there is no correlation between variables (Pereira, 2001).

The *Bartlett Test of Sphericity* is used to analyze the correlation matrix as a whole. Noronha (2005) states that the null matrix of this test stresses the fact that the correlation matrix is equal to the identity matrix, or that there is not enough correlation between variables, it is

recommended this significance value to be smaller than 0.05.

In the factorial analysis, the correlation-rotated matrix was used; it is also known as Varimax Rotation with Kaiser Normalization, using the *Statistical Package for the Social Sciences (SPSS)* software version 16.0. The intention is that, through this process, for each main component there are only a few significant weights and all others are close to zero, through the maximization of variance among the factors to the factorial matrix rotation (Malhotra, 2006).

KMO and Bartlett tests – base indexes

Table 1 presents the results of the KMO and Bartlett tests obtained in the first analysis performed with the 11 (eleven) initial variables.

Table.1: KMO and Bartlett results – studied variables

Test	Value Found	
Kaiser-Meyer-Olkin	0.572	
Bartlett Test of Sphericity	Approximate Chi-square	743.198
	Significance	0.000

Source: Research data – SPSS program

The KMO test indicated an explanation level of 0.572 among factors and variables, which therefore are valid in the view of Malhorta (2001) ($KMO > 0.50$). However, the Bartlett Test of Sphericity indicates if there is enough relation among indicators to the factorial analysis application. For this to be possible, it is recommended that the significance value is smaller than ($Bartlett < 0.05$) and in this case, was ($p=0,000$) (Hair. et al., 2005; Pereira, 2001).

Communalities Calculation – base indexes

According to Hair et al. (2005), communalities represent the amount of variance explained by the factorial solution for each variable, in order to indicate the importance of every variable within the model, and the total variance explained by each component. It must be evaluated if the communalities meet the explanation levels considered as minimum acceptable over 0.50. Table 2 shows the respective values:

Table.2: Communalities Calculation – base indexes

Indexes	Initial	Extraction
Total Debt	1.000	0.899
Immediate Liquidity	1.000	0.693
Asset Income	1.000	0.825
Profitability	1.000	0.889
Current Ratio	1.000	0.914
Quick Ratio	1.000	0.915
Overall Ratio	1.000	0.511
Solvency	1.000	0.753
Net Equity Debt	1.000	0.782
Net Equity Income	1.000	0.862
Asset Turnover	1.000	0.858

Source: Research data – SPSS program

By Table 2 it is noted that most indicators got a high explanation power, considering all factors obtained,

only the overall ratio presented a small value (0.511). It is observed that the initial communalities were 1 and for the

extracted factors, the variance percentage of each indicator explained by the common extracted factors is superior to 69.30% for all indexes. By the communalities matrix it is noted the important influence of variables of debt, income, profitability, and liquidity ratios used as bases in the model.

Kaiser-Meyer-Olkine Test and Bartlett Test of Sphericity – adjusted indexes

Although the BTS test indicates the possibility of application of the factorial analysis to the analyzed

variables, it was preferred to increase the explanation power of factors removing the overall ratio indicator (0.511), searching a better association between the analyzed variables, for there are other indexes within the base of study, which will certainly not damage the analyzed context. Thus, the indexes with 10 (ten) variables were recalculated, so the *Kaiser-Meyer-Olkine* test and the *Bartlett Test of Sphericity* were composed as shown in Table 3.

Table.3: KMO and Bartlett results – adjusted indexes

Test	Value Found	
Kaiser-Meyer-Olkin	0.728	
Bartlett Test of Sphericity	Approximate Chi-square	1423.746
	Significance	0.000

Source: Research data – SPSS program

The KMO test presented a significant improvement going from (0.572) to (0.728), therefore the factorial analysis is an adequate technique to be applied to the data of this research, as confirmed by Pestana, Gageiro (2005), and Malhorta (2006). For the Bartlett Test of Sphericity, a significance level of $p = 0.000$ was found, inferior to the significance level of 0.05, guaranteeing the rejection of the hypothesis that the correlations matrix is an identity matrix, showing, therefore, that there is

correlation among variables, and factorial analysis may be used.

Communalities Calculation – adjusted indexes

New communalities were calculated and presented in Table 4. The initial communalities were 1 and for extracted factors the variance percentage of each indicator explained by common extracted factors is superior to 70% for all indexes.

Table.4: Communalities Calculation – adjusted indexes

Indexes	Initial	Extraction
Total Debt	1.000	0.891
Immediate Liquidity	1.000	0.714
Asset Income	1.000	0.950
Profitability	1.000	0.879
Current Ratio	1.000	0.890
Quick Ratio	1.000	0.937
Solvency	1.000	0.739
Net Equity Debt	1.000	0.920
Net Equity Income	1.000	0.886
Asset Turnover	1.000	0.854

Source: Research data – SPSS program

Once the adequacy of the factorial analysis was found for the statistical treatment of the financial indicators studied and their internal consistency, the factors were identified through the method of principal components analysis, which transforms a set of variables in a new set of composed variables that are not correlated by the common extracted factors superior to 71.40% (Cooper and Schindler, 2003).

Table 5 presents the proper values for each factor (principal component since the method of principal

components was used to extract factors) and the percentage of the explained variance. With the removal of the overall ratio index, the explanation power was improved, going from a minimum original value of 69.30% to 71.40%. It is noted that from the 10 (ten) indexes, 80% of them are above 85% of the explanation power. For defining the number of factors, which had not been previously defined, Table 5 is presented:

Table.5: Eigenvalues

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.953	39.531	39.531	3.953	39.531	39.531	2.813	28.126	28.126
2	2.264	22.638	62.169	2.264	22.638	62.169	2.561	25.607	53.733
3	1.403	14.033	76.203	1.403	14.033	76.203	1.880	18.799	72.532
4	1.041	10.413	86.616	1.041	10.413	86.616	1.408	14.083	86.616
5	.625	.6253	92.868						
6	.397	.3970	96.838						
7	.187	.1866	98.704						
8	.054	.541	99.245						
9	.050	.500	99.745						
10	.026	.255	100.000						

Source: SPSS - Extraction Method: Principal Component Analysis

According to Hair et al. (2005) it is only considered those, which present eigenvalue superior to 1. Hence, 4 factors were considered, once they explain 86.63% of the data variance. After an eight stages

procedure, the identified factors and respective eigenvalues were obtained, which are found in the following Table 6:

Table.6: Identified factors and respective eigenvalues

Factors	Eigenvalues		
	Total	% of Variance	% Cumulative
1	2.813	28.126	28.126
2	2.561	25.607	53.733
3	1.880	18.799	72.532
4	1.408	14.083	86.616

Source: Research data – SPSS program

The eigenvalues, eigenvectors length, corresponding to its importance for the explanation of the total data variance, in this thesis meant 86.63%. Later, the "Scree" graphic, developed by Catelli was analyzed, where the number of factors was confirmed (Litwin, 1995).

Aiming to get a better interpretation of factors, the Varimax rotation was chosen because it assesses the maximization of the variance squares of loaded factors,

according to Johnson and Wichern (2002), it reduced the number of variables presenting high loads over one factor (Malhotra, 2006).

Hence, after 5 interactions, there was a reduction of number of 10 variables in 4 factors or analysis dimensions. The factors found, as well as the attributes belonging to each one of them and their respective factorial loads, are presented in Table 7.

Table.7: Factors and loaded factors of indexes

Indexes	Identified Factors			
	1	2	3	4
Total debt	0.802	-0.112	-0.483	0.011
Solvency	-0.642	0.084	0.558	-0.096
Net equity debt	0.953	-0.049	-0.036	-0.093
Net equity income	0.869	-0.111	0.012	0.344
Immediate liquidity	0.014	0.840	0.006	-0.093
Current ratio	-0.148	0.927	0.068	-0.062
Quick ratio	-0.114	0.951	0.092	-0.105
Profitability	-0.093	-0.014	0.858	0.367
Asset turnover	0.169	-0.169	-0.768	0.452
Asset income	0.108	-0.170	0.037	0.953

Source: Research data – SPSS program

The first factor (F1) was responsible for 28.126% of variances. It is composed by the total debt, net equity debt, net equity income, and solvency. It is noted that the factor is predominantly linked to debt indexes because it presents greater factorial loads. The factor proves debt commitment regarding the investment, as well as the reflex in its premium. For this reason the name of this factors is “**DEBT**”. The solvency index is negative, therefore moving in opposite direction from the other indexes indicating that the higher the debt the lower the solvency, and this situation is basically a standard within the context of financial economy.

The second factor (F2) that explains 25.607% of the total variation is composed by indexes of immediate liquidity, current ratio, and quick ratio according to Table 8. The great correlation among the variables mentioned can be explained by the fact that all of them refer to corporations' liquidity. This factor shows the base of the financial situation of a company, and if it offers a good base for payment of its current obligations. Due to this, the second factor was denominated “**LIQUIDITY**”.

The third factor (F3) explains 18.799% of the total variation and is made by profitability and asset turnover. Both indexes are linked to the corporation's performance, one relating to performance and the other to operational speed. Thus, this factor was denominated “**PROFITABILITY**”. In this factor the asset turnover is presented negatively, once as profitability increases asset turnover decreases, featuring operations with higher margin and low turnover.

Finally, the fourth factor (F4) explains 14.083% of the total data variation and is made by asset income, once it is the reflex of the corporation's capital juncture. This factor is understood as “**INCOME**”.

By the composition of the factors, it is noted that the variables that will make the investment grade indicator were all contemplated, divided in factors, and allocated by their higher weights, both positive and negative, totalizing the 10 (ten) indexes. Coming from the idea of creating an indicator that would cover the levels of investment grade derived from the application in economic and financial variables, the factors are formed according to the indexes, as Table 8 shows:

Table.8: Base factors of the indicator

Factors	Equation
FACTOR 1	0.802 * total debt - 0.642 * solvency + 0.953 * net equity debt + 0.869 * net equity income;
FACTOR 2	0.840 * immediate liquidity + 0.927 * current ratio + 0.951 * quick ratio;
FACTOR 3	0.858 * profitability - 0.768 * asset turnover;
FACTOR 4	0.958 * asset income.

Source: Prepared by the author

It is noted that 10 (ten) economic and financial indexes contemplated on the resulting factors (F1-F2-F3-F4), all have different weights that consider the investment grade indicator, where:

a) Analysis indexes are:

F1 = Debt

F1.1 - (Outstanding Liability/Total Asset);
F1.2 - (Total Asset/Outstanding Liability);
F1.3 - (Outstanding Liability/Net Equity);
F1.4 - ("Ebitda" Profit/Net Equity).

F2 = Liquidity

F2.1 - (Availables/Current Liability);
F2.2 - (Current Asset/Current Liability);
F2.3 - (Current Asset (-) Inventories/Current Liability).

F3 = Profitability

F3.1 - ("Ebitda" Profit/Net Operating Revenue);
F3.2 - (Net Operating Revenue/Total Asset).

F4 = Income

F4.1 - ("Ebitda" Profit/Total Asset).

b) Weights

Table 9: shows the weights that must be multiplied by the result obtained by each index:

Table.9: Weights and results obtained by indexes

Weight	Index
0.802	F1.1
-0.642	F1.2
0.953	F1.3
0.869	F1.4
0.840	F2.1
0.927	F2.2
0.951	F2.3
0.858	F3.1
-0.768	F3.2
0.958	F4.1

Source: Prepared by the author

The result of the investment grade indicator comes from the sum of factors. With the objective to standardize and homogenize the classification, its

numerator was divided by 1000 (one thousand), converting the result into thousandths; hence the following expression is achieved:

$$\text{Investment Grade Indicator} = \{(F1 = 0.802 * \text{total debt} - 0.642 * \text{solvency} + 0.953 * \text{net equity debt} + 0.869 * \text{net equity income}) + (F2 = 0.840 * \text{immediate liquidity} + 0.927 * \text{current ratio} + 0.951 * \text{quick ratio}) + (F3 = 0.858 * \text{profitability} - 0.768 * \text{asset turnover}) + (F4 = 0.958 * \text{asset income}) / 1000\}$$

Briefly, the following expression is achieved:

$$\text{Investment Grade Indicator} = (F1+F2+F3+F4) / 1000$$

Once the factorial analysis was completed, the reliability test was applied; according to Churchill Jr. (1979) and Hair Jr. (2005), it is the statistical resource capable of verifying the internal consistency of a variable with which to be measured. To do so, the internal

consistency of each one of the factors was verified by the *Cronbach's Alpha* (Chart 4).

It is important to highlight that the value found in each one of the factors was shown to be adequate since it is over 0.7. Factor 4 does not present the value of *Cronbach's Alpha* because it has only one index.

Chart.4: Internal consistency of identified factors

Factor	Number of indexes	Cronbach's Alpha
Factor 1	4	0.777
Factor 2	3	0.905
Factor 3	2	0.744
Factor 4	1	

Source: Research data – SPSS program

The *Cronbach's Alpha* value ranged from 0.777 to 0.905 in general, scales with alpha value smaller than 0.70 must be avoided, on the other hand, for Hora, Monteiro, and Arica (2010) superior values bring out an "optimist" estimate of reliability.

For the model considering all the factors, the *Cronbach's Alpha* was presented with the value of 0.768, indicating internal consistency of the study, because even if there was not a definite guiding scale with an acceptable value, studies indicate that it should not be inferior to 0.70, because it is seen as a tool for reliability estimation, therefore the value presented is superior to the minimum reliability index.

V. FINAL REMARKS

In the current context where economy is connected to the performance of corporations, especially in the financial field, it is essentially important to ensure the survival of both, because they are highly dependant.

Changes assumed dynamic features, regarding intensity and speed, the so wished balance goes from static to dynamic, local and national markets are not enough most of the time, so it is necessary to search globally, ongoing update and reinvention are increasingly urgent, corporate architectures change and demand economy and corporations to be open to these transformations.

The evolution of statistical treatment from the correlation analysis through Pearson's Linear Correlation Coefficient that initially presented a mostly weak correlation within a universe of fifty-five occurrences, where five were strong, sixteen were moderate, and thirty-four were weak. However, this does not invalidate Pearson's correlation once all coefficients presented some significance ($p < 0.05$).

The results, after the adjustment of indexes from eleven to ten, presented a KMO of 0.728, hence, confirming the application of data factorial analysis. In the Bartlett Test of Sphericity a significance level of $p = 0.000$ was found, inferior to the significance level of 0.05, ensuring the rejection of the hypothesis that the correlation matrix is an identity matrix, therefore, the factorial analysis may be used.

Once the adequacy of the factorial analysis was found for the statistical treatment of the financial indicators studied and their internal consistency, the number of 10 indexes analyzed became 4, explaining 86.62% of data variance, where the ones that presented eigenvalue were superior to 1.

After the factorial analysis was performed, the reliability test through *Cronbach's Alpha* was applied to individual factors from 0.777 to 0.905, in general, scales with alpha value smaller than 0.70 must be avoided. The

results, therefore, may be seen as optimists in reliability. For the model considering all the factors, the Cronbach's Alpha was presented with the value of 0.768, indicating internal consistency of the study; therefore the value is superior to the minimum reliability index, confirming the model created.

Thus it is safe to affirm that, based on the variables of the study (profitability, income, liquidity, and debt) it is possible to base the investment grade of a corporation.

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